NON-PUBLIC?: N
ACCESSION #: 8905220193
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Dresden Nuclear Power Station, Unit 3 PAGE: 1 of 5

DOCKET NUMBER: 05000249

TITLE: Reactor Scram Caused By Turbine Stop Valve Closure Due to
Control Relay Failure
EVENT DATE: 04/15/89 LER #: 89-006-00 REPORT DATE: 05/15/89

OPERATING MODE: N POWER LEVEL: 092

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Michael E. Moy, Technical Staff Engineer TELEPHONE: (815)942-2920
Ext. 2354

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: TA COMPONENT: RLY MANUFACTURER: G080
X TB 46 G080
REPORTABLE TO NPRDS: Y
Y

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On April 15, 1989 at 0320 hours with Unit 3 operating at 92% rated core thermal power, a reactor scram occurred during surveillance testing of the main turbine stop valves (TSVs). The cause of the scram was determined to be component failure. High contact resistance on a normally open contact prevented its, required closure during testing of the #2 TSV. This failure resulted in the remaining three TSVs starting to close when #2 TSV started to close. Also during this event the main generator output circuit breakers failed to open on reverse power. Consequently the main turbine was manually tripped at 0323 hours. The root cause of this failure was also attributed to component failure. Upon inspection of the main generator secondary reverse power relay, dirt was found between the bearing and contact pivot arm on the relay directional unit preventing proper operation. As corrective actions for this event two TSV control relays were replaced. The main generator secondary reverse power relay was cleaned and verified to operate properly. To help

prevent future failures of reverse power relays the calibration procedure will be revised to specifically address mechanical binding of the contact pivot arm. Prior to Unit startup all of the turbine control valves, stop valves, and combined intermediate valves were functionally tested. The safety
significance of this event was considered to be minimal since all reactor scram functions operated properly and the primary reverse power relay was available to prevent damage to the main generator. Two previous similar occurrences were reported by LER 89-002/050249 and LER 86-025/050249.

END OF ABSTRACT

PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2527 MWt rated core thermal power.

Nuclear Tracking System (NTS) tracking code numbers are identified in the text as (XXX-XXX-XX-XXXXX).

EVENT IDENTIFICATION:

Reactor scram caused by turbine stop valve closure due to a control relay failure. The reactor scram occurred during weekly turbine surveillance testing.

A. CONDITIONS PRIOR TO EVENT:

Unit: 3 Event Date: April 15, 1989 Event Time: 0320 hours
Reactor Mode: N Mode Name: Run Power Level: 92%

Reactor Coolant System (RCS) Pressure: 960 psig

B. EVENT DESCRIPTION:

On April 15, 1989 during normal Unit operation at 92% rated core thermal power, a reactor scram occurred at 0320 hours. The initiating scram signal was a result of main turbine stop valve (TSV) TA! closure. The TSV closure scram signal occurred as the Nuclear Station Operator (NSO) depressed the #2 TSV test pushbutton on Control Room Panel 903-7 to test the #2 TSV (in a closing direction) in accordance with Dresden Operating Surveillance (DOS) 5600-2, Monthly, Weekly, and Daily Turbine Checks. As the test pushbutton was depressed the remaining three TSVs began to close, approximately six bypass valves went open and a main turbine generator load reject signal initiated. Upon failure of the main generator output

breakers to open on reverse power a main turbine trip was manually initiated at 0323 hours and the main generator was isolated from the grid by the primary reverse power relay. The reactor scram signal was reset at 0420 hours. No other systems or components which may have contributed to the root cause of this event were inoperable at the time of this event.

C. APPARENT CAUSE OF EVENT:

The root cause of this event was determined to be component failure. Normally open contact XK30 XKF188-1 for control relay XK30 XEK188 (24 VDC General Electric Type CR120HF47J10A) was discovered to have a high contact resistance of approximately 200 ohms. The typical contact resistance for the same type relay contact is approximately 0 ohms. The installed control relay XK30 XKF188 is believed to have been the originally installed relay and therefore subjected to normal component wear.

During testing of the #2 TSV, control relay XK30 XKF188 is integral to the closure control logic of the remaining three TSVs. During normal operation, the test circuitry logic operates as follows (refer to "Figure 1). As test pushbutton SV2 is depressed, #2 TSV begins to close. Control Relay XK30 XKF188 energizes and its associated normally open contact XK30 XKF188-1 closes. When #2 TSV reaches 5% closed, limit switch "stop valve open switch" SVOS-2 closes. Following this action, relay K8004 KF186 energizes and its associated contact closes. Seal-in relay K7Dl9 KFI89 then energizes and its associated contacts (Note 1, Figure 1) close to prevent relay K6D19 KF190 from de-energizing when test pushbutton SV2 is released. With relay K6D19 KF190 energized, its associated normally closed contact opens to prevent relays XK16 and XK17 from energizing. This action prevents the remaining three TSVs from following the close response of the #2 TSV (Note 2, Figure 1).

The high contact resistance on normally open contact XK30 XKF188-1 prevented the contact from closing when control relay XK30 XKF188 was energized (test pushbutton SV2 depressed). Consequently, relay K6D19 KF190 remained de-energized, its associated normally closed contact remained closed, and relays XK16 and XK17 remained energized. As a result, when #2 TSV reached 5% closed, the other three TSVs began closing and initiated a reactor scram.

The main generator and thus the main turbine did not automatically trip due to component failure. The Operational Analysis Department (OAD) inspected the main generator reverse power relay per Work Request 84140 and found dirt located between the bearing and contact pivot arm on the relay directional unit. The dirt caused mechanical binding of the contact

pivot arm which prevented the contact from operating as required.

D. SAFETY ANALYSIS OF EVENT:

The initiating action for this event was the partial closure of all four turbine stop valves. Any combination of three or more TSVs each closed 10% or greater during normal power operation at greater than 45% will result in a reactor scram. The reactor scram occurs in anticipation of the pressure, neutron flux, and fuel cladding surface heat flux increase caused by the rapid closure of the TSVs and a failure of the turbine bypass valves to open. A reactor scram was the response to the TSV closures of this event. Additionally, the turbine bypass valves responded properly to the TSV closure.

The main generator protective relaying is designed such that two circuits will independently trip the generator on reverse power. The first trip circuit, associated with a primary reverse power relay, is initiated following a turbine trip signal. This circuit is designed to trip the generator at -1.3 MWe after a five second time delay. The second trip circuit is associated with a secondary reverse power relay and it is designed to trip the main generator at -1.3 MWe with a 15 second time delay in the absence of a turbine trip signal. Thus, the secondary reverse power relay should have initiated the generator trip since there were no turbine trip signals present. Although the secondary reverse power relay failed during this event, the primary reverse power relay was available in the event of a turbine trip. Also, the manual capability of tripping the turbine operated successfully thereby preventing damage t6 the generator.

For the above reasons, the safety significance of this event was considered to be minimal.

E. CORRECTIVE ACTIONS:

Corrective actions for this event involved testing of control relays XK30 XKF188 and K6D19 KDF189. Although the only problem discovered was the contact high resistance on relay XK30 XKF188, both relays were replaced. This work was completed on April 18, 1989 under Work Request 84112. Corrective actions for the secondary reverse power relay failure involved the removal of dirt found between the bearing surface and the contact pivot am surface. After removing the dirt between the surfaces, the relay operated successfully. The reverse power relays are inspected and calibrated on a refueling outage basis in accordance with the OAD Protective Relay Calibration Procedure. No problems were discovered during the previous inspection. To prevent future failures of this type, the relay calibration procedure will be revised to clarify the physical

inspection section such that mechanical binding of the relay pivot arm is specifically addressed. This revision will be tracked through . completion by a commitment made in LER 89-002/050249 (249-200-89-02005).

Prior to rolling the main turbine during Unit startup in accordance with Dresden General Procedure (DGP) 1-1, Unit 2(3) Normal Unit Startup, all of the turbine control valves, stop valves, and combined intermediate valves were functionally tested in accordance with DOS 5600-2 and DOS 500-10, Turbine Stop Valve Closure Scram Circuit Functional Test. As Unit startup continued, the same turbine valves were again functionally tested once reaching 1800 rpm but prior to synchronizing the main generator to the grid. Once the main generator was synchronized to the grid, all turbine valves were again functionally tested just prior to reaching 40% rated core thermal power. Finally, reactor power output was administratively limited to 40% until all surveillance testing results were completely reviewed to ensure that no problems existed within the control circuitry of the turbine control valves, stop valves, and combined intermediate valves.

F. PREVIOUS OCCURRENCES:

LER/Docket Number Title

89-002/050249 Reactor Scram Due to Failure of an Electrical Protection Assembly Breaker.

A reactor scram resulted due to the failure of an Electrical Protection Assembly (EPA) breaker. However, this event also involved the failure of the main generator to trip on reverse power with approximately -20 MWe indicated on the Center Desk display. The cause of this event became evident during the investigation performed for LER 89-006/050249.

86-025/050249 Unit 3 Turbine Stop Valve 10% Closure Scram Due to Limit Switch Contact Failure.

This report documented a reactor scram due to component failure. Investigation of this event determined that limit switch SVOS-2 had momentarily opened and then reclosed as a result of the contacts being carbonized. This resulted in the closure of the TSVs. The corrective

actions for this event involved replacement of
limit switch SVOS-2.

G. COMPONENT FAILURE DATA:

Manufacturer Nomenclature Model Number Mfg. Part Number

General Control CR120HF47J10A N/A
Electric Relay

General Reverse GGP53C N/A
Electric Power Relay

An industry wide NPRDS component search was performed and there were no reported previous failures of either of these two types of relays.

FIGURE OMITTED - NOT KEYABLE (DRAWING)

Note 1: This contact is associated with seal-in circuit relay K7F19 KF189 and closes when the relay is energized.

Note 2: These relays when energized cause #1,
and 4 turbine stop valves
to follow the action of #2 turbine stop valve.

TURBINE STOP VALVE TEST LOGIC

Figure 1

Commonwealth Edison
Dresden Nuclear Power Station
R.R. #1
Morris, Illinois 60450
Telephone 815/942-2920

May 15, 1989

EDE LTR #89-391

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Licensee Event Report #89-006-0, Docket #050249 is being submitted as required by Technical Specification 6.6, NUREG 1022 and 10 CFR 50.73(a)(2)(iv).

E.D. Eenigenburg
Station Manager
Dresden Nuclear Power Station

EDE/ade

Enclosure

cc: A. Bert Davis, Regional Administrator, Region III
File/NRC
File/Numerical

(0573k)

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